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10/541,952	12/01/2005	Peter James Mawle	M03B107	6744

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EXAMINER	
WU, IVES J	

ART UNIT	PAPER NUMBER
1797	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/541,952	MAWLE, PETER JAMES	
	Examiner	Art Unit	
	IVES WU	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

(1). **Claim 9** is objected to because of the following informalities:

In claim 9, it recites: ionic species is NO_3. It would be NO^-_3. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

(2). **Claims 1-2, 4-14** are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tran et al (US 6309532B1), evidenced by Dingman, Jr. et al (US 6071484A).

As to step of continuously circulating water through an essentially closed loop incorporating a gas scrubbing unit and an ion absorption unit comprising a water permeable ion absorbing means in a method for treatment of gaseous chemical waste in **independent claim 1**, Tran et al (US 6309532B1) disclose method and apparatus for capacitive deionization and electrochemical purification and regeneration of electrodes (Title). It relates to an electrochemical separation method and apparatus for removing ions, contaminants and impurities from water, fluids, and other aqueous process streams and for placing the removed ions into solution during the regeneration (Col. 1, line 26-30). By using the CDI separation system, it is now possible to remove organic and inorganic contaminants and impurities from liquid streams by the following physiochemical processes, the reversible electrostatic removal of organic and

inorganic ions from water or any other dielectric solvent; the reversible or irreversible removal of any organic or inorganic impurities by any other adsorption process, including but not limited to underpotential metal deposition, chemi-sorption, and physic-sorption (Col. 37, line 7-17). More specific applications for CDI system and process include any application where the capacitive deionizer is used to assist a gas scrubbing column (Col. 37, line 24-26). As shown in the Figure 22, the anion exchange polymeric coating and cation exchange polymeric coating which read on the ion absorbing means. Tran et al **do not teach** the re-circulating water through an essentially closed loop as claimed. however, it would have been obvious to have closed loop with gas scrubber and ion absorption unit in order to use the resource – purified water as evidenced by Dingman, Jr. et al (US 6071484A) in Figure 2, a closed loop scrubbing system is illustrated.

As to step of feeding exhaust gas or reaction product thereof to the gas scrubbing unit for dissolution in the circulating water thereby to form an aqueous solution containing ionic species derived from the exhaust gas in a method in **independent claim 1**, the gas scrubbing unit disclosed by Tran et al would inherently possess the features as claimed.

As to step of continuously bringing the circulating water into contact with ion absorbing means in the ion absorption unit while applying an electrical potential across the thickness of the ion absorbing means and removing from the ion absorbing unit a more concentrated aqueous solution of ion species in a method **in independent claim 1**, Tran et al (US 6309532B1) disclose Figure 22 which illustrates the features such as an electrical potential across the thickness of the ion absorbing means. Capacitive deionization can, for instance, produce a continuous flow of product water by operating two stacks of carbon aerogel electrodes in parallel. One stack purifies while the other is electrically and/or chemically regenerated (Col. 29, line 53-56). It would remove from the absorption unit a more concentrated aqueous solution of ionic species once the unit is in regeneration mode.

As to step of continuously adding to the closed loop a quantity of water corresponding to the quantity of aqueous solution of ionic species removed from the ion absorption unit in a method **in independent claim 1,** it would be obvious to have a quantity of water continuously adding to the loop because loss of water in regeneration mode, also for the purpose of continuous operation of the system.

As to ion absorbing means comprising a water permeable layer of ion absorbing material in **claim 2,** and a water permeable zone of an ion absorbing material in **claim 4**, Tran et al (US 6309532B1) disclose Figure 22 which include anion exchange polymeric coating and cation exchange polymeric coating to be water permeable for waste water treatment.

As to the exhaust gas or the reaction product being fed continuously to the gas scrubber unit in **claim 5** and fed intermittently in **claim 6**, it is well known in the art that gas scrubber can be operated in batch or continuous mode, even the gas scrubber is integrated with the ion absorbing means in closed loop, the capacitive deionization apparatus disclosed by Tran et al is able to operate in batch or continuous mode (Col. 15, line 40-44).

As to exhaust gas or reaction product containing HF and ionic species F^- in **claim 7**, exhaust gas or reaction product containing HCl and ionic species Cl^- in **claim 8**, exhaust gas or reaction product containing oxide of nitrogen and ionic species NO_3^- in **claim 9**, exhaust gas or reaction product containing oxide of sulfur and ionic species SO_4^- in **claim 10**, exhaust gas or reaction product containing oxide of phosphorus and ionic species PO_4^- in **claim 11**, Tran et al (US 6309532B1) disclose commercial application including non oxidizable organic and inorganic anions: OH^-, Cl^-, I^-, F^-, NO^-_3, SO^{-2}_4, PO^{3-}_4 (Col. 36, line 7-38). By using the CDI separation system, it is now possible to remove organic and inorganic contaminants and impurities from liquid streams by the following physiochemical processes, the reversible electrostatic removal of organic and inorganic ions from water or any other dielectric solvent; the reversible or irreversible removal of any organic or inorganic impurities by any other adsorption process, including but not limited to underpotential metal deposition, chemi-sorption, and physic-sorption (Col. 37, line 7-17). Therefore, it would include the components as listed in the instant claim.

As to an essential closed loop circulation system containing a gas scrubbing unit and an ion absorption unit comprising a water permeable ion absorbing means for enabling an electrical potential to be applied across the thickness of ion absorbing means in an apparatus for treating gaseous chemical waste in **independent claim 12**, the disclosure of Tran et al, Dingman, Jr. et al is incorporated herein by reference, the most subject matters as currently claimed, have been recited in Applicant's claim 1, and have been discussed therein.

As to a pump for continuously circulating water around the closed loop in **independent claim 12**, it would be obvious to have a pump for recirculation as evidenced by Dingman, Jr. et al in Figure 2 including a pump unit.

As to an inlet for exhaust gas or reaction product thereof into the gas scrubbing unit; an inlet for water into the closed loop circulation system; an outlet for concentrated aqueous solution of ionic species from ion absorption unit in **independent claim 12**, it would be obvious to have an inlet for exhaust gas into the gas scrubbing unit in order to scrub the gas. It also would be obvious to have inlet for water in circulation system in order to provide the water. As shown in Figure 22 of Tran et al the outflow which reads on the feature of instant claim.

As to ion absorbing means comprising a water permeable layer of ion absorbing material in **claim 13,** and a water permeable zone of an ion absorbing material in **claim 14**, Tran et al (US 6309532B1) disclose Figure 22 which include anion exchange polymeric coating and cation exchange polymeric coating to be water permeable for waste water treatment.

(3). **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Mir (US 6187162B1).

As to continuously circulating water to be brought into contact with one surface of the layer of ion absorbing material in the ion absorption unit and the more concentrated aqueous solution of the ionic species to be removed via the other surface of the layer in **claim 3,** Tran et al **do not teach** to remove the concentrated aqueous solution of the ionic species via the other surface of the layer as claimed.

However, Mir (US 6187162B1) **teaches** electro-deionization apparatus with scaling control (Title). As shown in Figure 1, brine 26 entering inlet 28 of concentrating chambers 12, picks up ions removed from the diluting channels, and leaves outlet 30 (Col. 4, line 67 - Col. 5, line 2).

The advantage of removing the concentrated aqueous solution from other side is to provide with resistance to scaling formation (Col. 5, line 5-6).

Therefore, it would have been obvious to have the arrangement such as in single-stage electro-deionization taught by Mir for the capacitive deionization unit of Tran et al in order to obtain the cited above advantage.

(4). **Claim 15** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Keller (US 5045291), as evidenced by Tomoi et al (US 5350523A).

As to heat exchanger within the closed loop in **claim 15**, Tran et al (US 6309532B1) **do not teach** the heat exchanger as claimed.

However, Keller (US 5045291) **teaches** reactivation of spent alkanolamine (Title). As shown in the Figure 1, a cooler 34 located before the ion exchange.

The advantage of cooler before the ion exchange is to avoid degradation of the absorption medium as well known in the art. As evidenced by Tomoi et al (US 5350523A) in background teaching that detachment would occur in anion exchange resin at high temperature.

Therefore, it would have been obvious at time of the invention to install the cooler of Keller before the ion absorption device of Tran et al in order to obtain the cited advantages.

(5). **Claim 16** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Yan (US 4795565).

As to a filter within the closed loop in **claim 16**, Tran et al (US 6309532B1) **do not teach** filter as claimed.

However, Yan (US 4795565) **teaches** cleanup of ethanolamine to improve performance and control corrosion of ethanolamine units (Title). As shown in the Figure 1, filter 11 located before the ion exchange.

The advantage of filter before the ion exchange is to remove the solid suspension (Col. 3, line 39).

Therefore, it would have been obvious at time of the invention to install filter of Yan before the ion absorption device of Tran et al in order to obtain the cited advantages.

(6). **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over Tran et al (US 6309532B1) in view of Yan (US 4795565). Evidenced by Okada et al (US 4141828).

As to hydro-cyclone within the closed loop in **claim 17**, Tran et al, Yan **do not teach** hydro-cyclone as claimed.

However, it is well known hydrocyclone to be used to separate solid-liquid as evidenced by Okada et al (US 4141828) (Col. 5, line 28-30). Therefore, it would have been obvious to substitute the filter of Yan with hydrocyclone of Okada et al for the ion absorbing device of Tran et al based on their interchangeability as functionally equivalent solid-liquid separation device.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu
Art Unit: 1797
Date: December 19, 2008

/Duane S. Smith/
Supervisory Patent Examiner, Art Unit 1797